

The documentation and process conversion measures necessary to comply with this revision shall be completed by 23 April 2003

INCH-POUND

MIL-PRF-19500/642A  
23 JANUARY 2003  
SUPERSEDING  
MIL-PRF-19500/642  
18 April 1997

## PERFORMANCE SPECIFICATION

SEMICONDUCTOR DEVICE, DIODE, SILICON,  
POWER RECTIFIER, DUAL, COMMON CATHODE OR ANODE CENTER TAP, ULTRAFAST,  
TYPES 1N6762 THROUGH 1N6765 AND 1N6762R THROUGH 1N6765R  
JANTX, JANTXV, AND JANS

This specification is approved for use by all Departments  
and Agencies of the Department of Defense.

### 1. SCOPE

1.1 Scope. This specification covers the performance requirements for silicon, dual ultrafast, power rectifier diodes in a center-tap configuration. Three levels of product assurance are provided for each device type as specified in MIL-PRF-19500.

1.2 Physical dimensions. See figure 1 (T0-254AA, isolated).

\*

1.3 Maximum ratings.

Types	$V_{RWM}$ (1) $I_D = 10 \mu A$ dc	$I_F$ (1) (2) $T_C = +100^\circ C$	$I_{FSM}$ (1) $t_p = 8.3$ ms	$R_{\theta JC}$ (1)	$R_{\theta JA}$ (1)	$T_{STG}$ and $T_J$
	$\frac{V}{dc}$	$\frac{A}{dc}$	$\frac{A(pk)}{165}$	$\frac{^\circ C/W}{2.0}$	$\frac{^\circ C/W}{40}$	$^\circ C$
1N6762, 1N6762R	50	12	165	2.0	40	-65 to +150
1N6763, 1N6763R	100					
1N6764, 1N6764R	150					
1N6765, 1N6765R	200					

(1) Each individual diode.

(2) Derate at 240 mA/°C above  $T_C = +100^\circ C$ .

1.4 Primary electrical characteristics. Unless otherwise specified, characteristics are per diode at +25°C.

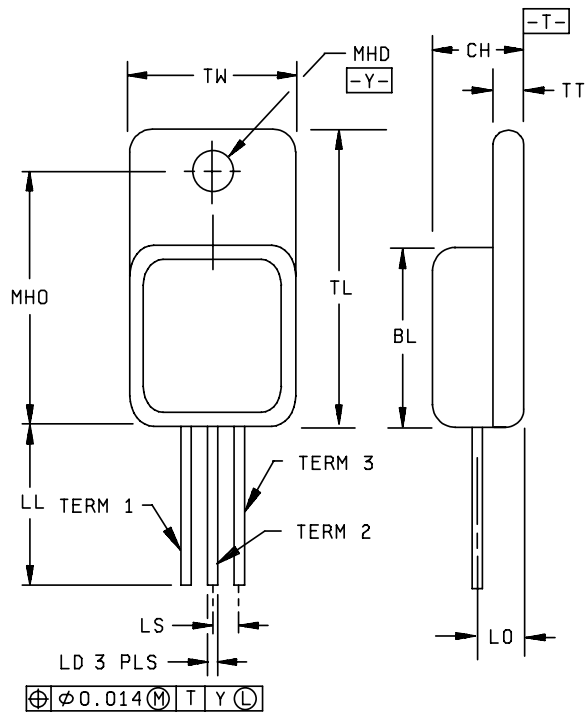
Types	$V_{F1}$ $I_F = 6$ A dc	$V_{F2}$ $I_F = 12$ A dc	$I_{R1}$ (see 1.3) $V_R = 0.8 V_{RWM}$	$I_{R2}$ $V_R = 0.8 V_{RWM}$ (see 1.3) $T_C = +100^\circ C$	$t_{rr}$	$C_J$ $V_R = 5$ V $f = 1$ MHz
	$\frac{V}{dc}$	$\frac{V}{dc}$	$\frac{\mu A}{dc}$	$\frac{\mu A}{dc}$	$\frac{ns}{35}$	$\frac{pF}{300}$
1N6762, 1N6762R	0.95	1.05	10	500	35	300
1N6763, 1N6763R						
1N6764, 1N6764R						
1N6765, 1N6765R						

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Defense Supply Center Columbus, ATTN: DSCC-VAC, P.O. Box 3990, Columbus, OH 43216-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 5961

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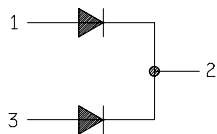
Dimensions				
Symbol	Inches		Millimeters	
	Min	Max	Min	Max
BL	.535	.545	13.59	13.84
CH	.249	.260	6.32	6.04
LD	.035	.045	0.89	1.14
LL	.510	.570	12.95	14.48
LO	.150 typ		3.81 typ	
LS	.150 bsc		3.81 bsc	
MHD	.139	.149	3.53	3.78
MHO	.665	.685	16.89	17.40
TL	.790	.800	20.07	20.32
TT	.040	.050	1.02	1.27
TW	.535	.545	13.59	13.84

## NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. All terminals are isolated from case.

SCHEMATIC

1N6762, 1N6763, 1N6764, 1N6765



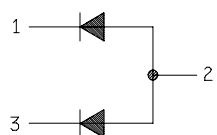
Terminal

Description

1  
2  
3

Anode 1  
Cathode  
Anode 2

1N6762R, 1N6763R, 1N6764R, 1N6765R



Terminal

Description

1  
2  
3

Cathode 1  
Anode  
Cathode 2

FIGURE 1. Physical dimensions and configuration (T0-254AA, isolated).

## 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

### 2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

#### SPECIFICATION

##### DEPARTMENT OF DEFENSE

MIL-PRF-19500 - Semiconductor Devices, General Specification for.

#### STANDARD

##### DEPARTMENT OF DEFENSE

MIL-STD-750 - Test Methods for Semiconductor Devices.

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Document Automation and Production Services (DAPS), Building 4D (DPM-DODSSP), 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

## 3. REQUIREMENTS

3.1 General. The individual item requirements shall be as specified in MIL-PRF-19500 and as modified herein.

3.2 Qualification. Devices furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturer's list (QML) before contract award (see 4.2 and 6.4).

3.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500.

3.4 Interface and physical dimensions. Interface and physical dimensions shall be as specified in MIL-PRF-19500, and on figure 1.

3.4.1 Lead finish. Lead finish shall be solderable in accordance with MIL-PRF-19500, MIL-STD-750, and herein. Where a choice of lead finish is desired, it shall be specified in the acquisition document (see 6.2).

3.4.2 Polarity. Polarity and terminal configuration shall be in accordance with figure 1 herein.

3.5 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in 1.3, 1.4, and table I.

3.6 Electrical test requirements. The electrical test requirements shall be group A as specified herein.

3.7 Marking. Marking shall be in accordance with MIL-PRF-19500.

3.8 Workmanship. Semiconductor devices shall be processed in such a manner as to be uniform in quality and shall be free from other defects that will affect life, serviceability, or appearance.

#### 4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.2).
- b. Screening (see 4.3).
- c. Conformance inspection (see 4.4).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500 and as specified herein.

4.3 Screening (JANTX, JANTXV, and JANS levels). Screening shall be in accordance with table IV of MIL-PRF-19500, and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

Screen (see table IV of MIL-PRF-19500)	Measurement	
	JANS level	JANTX and JANTXV levels
(1) 3c	Thermal impedance (see 4.3.2)	Thermal impedance (see 4.3.2)
9 and 10	Not applicable	Not applicable
11	$I_{R1}$ and $V_{F1}$	$I_{R1}$ and $V_{F1}$
12	See 4.3.1, $t = 240$ hours	See 4.3.1, $t = 48$ hours
13	Subgroups 2 and 3 of table I herein; $V_{F1}$ and $I_{R1}$ ; $\Delta I_{R1} \leq 100$ percent of initial value or $\pm 2.5 \mu A$ , whichever is greater; $\Delta V_{F1} \leq \pm 100$ mV.	Subgroup 2 of table I herein; $V_{F1}$ and $I_{R1}$ ; $\Delta I_{R1} \leq 100$ percent of initial value or $\pm 2.5 \mu A$ whichever is greater; $\Delta V_{F1} \leq \pm 100$ mV.

(1) Thermal impedance shall be performed any time before screen 13.

4.3.1 Power burn-in conditions. Power burn-in conditions are as follows: Method 1038 of MIL-STD-750, test condition A.  $T_C = +125^\circ C$ ;  $V_R = 0.8$  of rated  $V_{RWM}$  (see 1.3).

4.3.2 Thermal impedance ( $Z_{\theta JX}$ ) measurements for screening. The  $Z_{\theta JX}$  measurements shall be performed in accordance with method 3101 of MIL-STD-750. Test each die separately. The maximum limit (not to exceed the group A, subgroup 2 limits) and conditions for  $Z_{\theta JX}$  in screening (table IV of MIL-PRF-19500) shall be derived by each vendor by means of statistical process control. When the process has exhibited control and capability, the capability data shall be used to establish the fixed screening limit. In addition to screening, once a fixed limit has been established, monitor all future sealing lots using a random five piece sample from each lot to be plotted on the applicable X, R chart. If a lot exhibits an out of control condition, the entire lot shall be removed from the line and held for engineering evaluation and disposition. This procedure may be used in lieu of an inline process monitor.

4.3.2.1 Thermal impedance ( $Z_{\theta JX}$ ) measurements for initial qualification or requalification. The  $Z_{\theta JX}$  measurements shall be performed in accordance with method 3101 of MIL-STD-750 (read and record data  $Z_{\theta JX}$ ). Derived conditions limits and thermal response curve shall be supplied to the qualifying activity on the qualification lot prior to qualification approval. Measurement conditions shall be in accordance with 4.4.1.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500 and as specified herein.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-PRF-19500 and table I, subgroup 2 herein. Electrical measurements (end-points) and delta requirements shall be in accordance with the applicable steps of table II herein. The following test conditions shall be used for  $Z_{\theta JX}$ , group A inspection

- a.  $I_M$  measure current ----- 15 mA.
- b.  $I_H$  forward heating current ----- 10-50 A.
- c.  $t_H$  heating time ----- 200 ms.
- d.  $t_{MD}$  measurement delay time ----- 35  $\mu$ s.
- e.  $V_H$  heating voltage ----- 1 V.

\* The maximum limit for  $Z_{\theta JX}$  under these conditions are  $Z_{\theta JX}(\max) = 1.8^\circ\text{C/W}$

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VIa (JANS) and table VIb (JANTX and JANTXV) of MIL-PRF-19500 and as follows. Electrical measurements (end-points) and delta requirements shall be in accordance with the applicable steps of table II herein.

4.4.2.1 Group B inspection, table VIa (JANS) of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
4	1037	$I_F$ or $I_O = 1.25$ A to 10 A; $\Delta T_J = +85^\circ\text{C}$ minimum, for 2,000 cycles minimum.

4.4.2.2 Group B inspection, table VIb (JANTX and JANTXV) of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
3	1037	$I_F$ or $I_O = 1.25$ A to 10 A; $\Delta T_J = +85^\circ\text{C}$ minimum, for 2,000 cycles minimum.

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VII of MIL-PRF-19500 and as follows. Electrical measurements (end-points) and delta requirements shall be in accordance with the applicable steps of table II herein.

4.4.3.1 Group C inspection, table VII of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
2	2036	Test condition A, 5 pounds, $t = 15$ seconds $\pm 3$ seconds.
6	1037	$I_F$ or $I_O = 1.25$ A to 10 A; $\Delta T_J = +85^\circ\text{C}$ minimum, for 6,000 cycles minimum.

4.4.4 Group E inspection. Group E inspection shall be conducted in accordance with the conditions specified for subgroup testing in table III herein. Electrical measurements (end points) and delta requirements shall be in accordance with the applicable steps and footnotes of table II herein.

4.4.5 Thermal resistance. Thermal resistance measurements shall be performed in accordance with method 3101 of MIL-STD-750. The maximum limits for  $R_{\theta jc}(\text{max})$  shall be  $2.0^\circ\text{C/W}$  for devices in the TO-254AA case style. Each diode leg shall be measured. The following parameter measurements shall apply:

- a.  $I_M$  measure current ----- 15 mA.
- b.  $I_H$  forward heating current ----- 10A - 50 A.
- c.  $t_H$  heating time ----- Steady-state (see method 3101 of MIL-STD-750).
- d.  $t_{MD}$  measurement delay time ----- 35  $\mu\text{s}$ .
- e.  $V_H$  heating voltage ----- 1 V.

4.5 Methods of inspection. Methods of inspection shall be as specified in the appropriate tables and as follows.

4.5.1 Pulse measurements. Conditions for pulse measurement shall be as specified in section 4 of MIL-STD-750.

TABLE I. Group A inspection. 1/ 2/

Inspection	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical examination	2071					
<u>Subgroup 2</u>						
Thermal impedance 3/	3101	See 4.4.1	$Z_{\theta JX}$		1.8	°C/W
Breakdown voltage 1N6762, 1N6762R 1N6763, 1N6763R 1N6764, 1N6764R 1N6765, 1N6765R	4022	$I_R = 10 \mu A$ dc, pulsed 4/	$V_{BR}$	50 100 150 200		V dc
Forward voltage	4011	$I_F = 6 A$ dc, pulsed 4/ $I_F = 12 A$ dc, pulsed 4/	$V_{F1}$ $V_{F2}$		0.95 1.05	V dc V dc
Reverse leakage current	4016	DC method; pulsed 4/ $V_R = 0.8$ of $V_{RWM}$ (see 1.3)	$I_{R1}$		10	$\mu A$ dc
<u>Subgroup 3</u>						
High temperature operation:		$T_C = +100^\circ C$				
Reverse leakage current	4016	DC method; pulsed 4/ $V_R = 0.8$ of $V_{RWM}$ (see 1.3)	$I_{R2}$		500	$\mu A$ dc
Low temperature operation:		$T_A = -55^\circ C$				
Forward voltage	4011	$I_F = 12 A$ dc, pulsed 4/	$V_{F3}$		1.25	V dc
<u>Subgroup 4</u>						
Scope display evaluation 5/	4023					
Reverse recovery time measurements	4031	Condition B; $I_F = 1.0 A$ , $di/dt = 50 A/\mu s$	$t_{rr}$		35	ns
<u>Subgroups 5 and 6</u>						
Not applicable						
<u>Subgroup 7</u>						
Junction capacitance	4001	$V_R = 5 V$ dc; $f = 1.0 MHz$	$C_J$		300	pF

1/ For sampling plan, see MIL-PRF-19500.

2/ Each individual diode.

3/ If 4.4.1 test conditions are performed in 100 percent screening, this test need not be performed in table I.

4/ Pulse test: Pulse width = 300  $\mu s$ , duty cycle  $\leq 2$  percent.

5/ The reverse breakdown characteristics shall be viewed on an oscilloscope with display calibration factors of 50 to 100  $\mu A$ /division and 50 to 100 V/division. Reverse current over the knee shall be at least 500  $\mu A$ . Each device may exhibit a slightly rounded characteristic and any discontinuity or dynamic instability of the trace shall be cause for rejection.

TABLE II. Groups A, B, C, and E electrical measurements. 1/ 2/ 3/

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1	Forward voltage	4011	$I_F = 12$ A dc pulsed	$V_{F2}$		1.05	V dc
2	Reverse leakage current	4016	$V_R = 80$ percent rated $V_R$ (see 1.3) DC method, pulsed	$I_{R1}$		10	$\mu$ A dc
3	Forward voltage	4011	$I_F = 12$ A dc pulsed	$\Delta V_{F2}$		$\pm 100$ mV dc from initial reading	
4	Reverse leakage current	4016	$V_R = 80$ percent rated $V_R$ (see 1.3) DC method, pulsed	$\Delta I_{R1}$		100 percent of initial value or $\pm 2.5$ $\mu$ A dc whichever is greater.	
5	Thermal impedance	3101	See 4.3.2.1	$Z_{\theta JX}$		1.80	$^{\circ}$ C/W

\*

1/ The electrical measurements for table VIa (JANS) of MIL-PRF-19500 are as follows:

- a. Subgroup 3, see table II herein, steps 1 and 2.
- b. Subgroup 4, see table II herein, steps 1, 2, 3, 4, and 5.
- c. Subgroup 5, see table II herein, steps 1, 2, 3, and 4.

2/ The electrical measurements for table VIb (JANTX and JANTXV) of MIL-PRF-19500 are as follows:

- a. Subgroup 2, see table II herein, steps 1 and 2.
- a. Subgroup 3, see table II herein, steps 1, 2, and 5.
- a. Subgroup 6, see table II herein, steps 1 and 2.

3/ The electrical measurements for table VII of MIL-PRF-19500 are as follows:

- a. Subgroups 2 and 3, see table II herein, steps 1 and 2 for all levels.
- a. Subgroup 6, see table II herein, steps 1, 2, and 5 for all levels.



TABLE III. Group E inspection (all quality levels) for qualification only. 1/

Inspection	MIL-STD-750		Sampling plan
	Method	Conditions	
<u>Subgroup 1</u>			22 devices c = 0
Thermal shock (temperature cycling)	1051	500 cycles	
Hermetic seal	1071		
Fine leak		Test condition H $5 \times 10^{-7}$ atm cc/s	
Gross leak		Test condition C or K	
Electrical measurements		See table II herein, steps 1 and 2	
<u>Subgroup 2</u>			22 devices c = 0
Steady-state reverse bias	1038	Test condition A t = 1,000 hours, $T_C = +125^\circ\text{C}$ $V_R = 0.8$ of rated $V_{RWM}$ (see 1.3)	
Electrical measurements		See table II herein, steps 1 and 2	
<u>Subgroup 3</u>			3 devices c = 0
Destructive physical analysis	2101		
<u>Subgroup 4</u>			22 devices c = 0
Thermal resistance	3101	See 4.4.5; $R_{\theta JC} = 1.8^\circ\text{C/W}$	
<u>Subgroup 5</u>			
Not applicable			

\*

1/ For initial design and process change verification only (one time testing).

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The notes specified in MIL-PRF-19500 are applicable to this specification.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number and date of the specification.
- b. Issue of DODISS to be cited in the solicitation and, if required, the specific issue of documents referenced (see 2.2.1).
- c. Lead finish or formation may be specified (see 3.4.1).
- d. Type designation and product assurance level.
- e. Packaging requirements (see 5.1).

6.3 Cross reference list. Parts covered by this specification may be used to replace the following commercial Part or Identifying Numbers (PIN):

Preferred types	Commercial types
JANTX1N6762, JANTX1N6762R JANTX1N6763, JANTX1N6763R JANTX1N6764, JANTX1N6764R JANTX1N6765, JANTX1N6765R	1N6762, 1N6762R 1N6763, 1N6763R 1N6764, 1N6764R 1N6765, 1N6765R
JANTXV1N6762, JANTXV1N6762R JANTXV1N6763, JANTXV1N6763R JANTXV1N6764, JANTXV1N6764R JANTXV1N6765, JANTXV1N6765R	1N6762, 1N6762R 1N6763, 1N6763R 1N6764, 1N6764R 1N6765, 1N6765R

6.4 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers' List (QML) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center, Columbus, ATTN: DSCC/VQE, P.O. Box 3990, Columbus, OH 43216-5000.

6.5 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians  
Army - CR  
Navy - EC  
Air Force - 11  
NASA - NA  
DLA -CC

Preparing activity:  
DLA - CC  
  
(Project 5961-2643)

## STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

### INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
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<b>I RECOMMEND A CHANGE:</b>	1. DOCUMENT NUMBER MIL-PRF-19500/642A	2. DOCUMENT DATE 23 January 2003
3. <b>DOCUMENT TITLE</b> SEMICONDUCTOR DEVICE, DIODE, SILICON, POWER RECTIFIER, DUAL, COMMON CATHODE OR ANODE CENTER TAP, ULTRAFast, TYPES 1N6762 THROUGH 1N6765 AND 1N6762R THROUGH 1N6765R, JANTX, JANTXV, AND JANS		
4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)		
5. REASON FOR RECOMMENDATION		
6. SUBMITTER		
a. NAME (Last, First, Middle initial)	b. ORGANIZATION	
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